

May 22nd, 2025

Future AP Chemistry Students,

I am sending out this packet that I have provided (adjusted from time to time) to future AP Chemistry over the past 20+ years. As many of you know, I am retiring at the end of the year, so I will not be your teacher next year.

As of right now, your teacher next year will be Miss Patrus, who will be coming to Anchor Bay right out of college. At some point this summer, she will be given an Anchor Bay email address (epatrus@abs.misd.net). If you have questions, you can reach out to her; it would probably be good to wait until the last half of August to do this, however!

I imagine that her teaching style will be quite different than mine. Some of you will probably appreciate that! Regardless, it is important for you to understand the following:

AP Chemistry is hard!

- AP Chemistry curriculum covers an intense amount of material.
- You are at a disadvantage having had only one semester of chemistry prior to this class.

AP Chemistry is standardized.

- Before you step into AP Chemistry class next year, you can get a sneak peak on what you will be taught. (See the link below.)
- There are more resources (books, websites, YouTube videos, CollegeBoard resources, etc.) than you could even come close to exhausting. USE THEM!
- Free Response questions from previous years tests, along with their answers, are available on-line. (Just search for "AP Chem free response 2016" for example. The questions and the scoring guidelines

<https://apcentral.collegeboard.org/media/pdf/ap-chemistry-course-and-exam-description.pdf>

AP Chemistry is intended to be a college-level course. We will be following the guidelines set forth by The College Board AP Program for Chemistry and will be using a college-level textbook. The material will be covered quickly (much is review of or expanding on Chemistry 1 topics) and you will be expected to efficiently use the resources provided for you. A lot of preparation for labs, quizzes, and tests will be expected **outside of the classroom**. At the end of the year, it is expected that all students will be prepared to be successful on the AP Chemistry test. A score of 3, 4, or 5 out of 5 will allow you to get credit at most colleges, making your schedule more flexible and saving you (or your parents) money.

You need to realize that this class will be challenging for every one of you. The pace of the class and the depth of the material will require you to put in more time and effort than many of you are accustomed. You will be expected to be an active participant in class (share your talents!). You have the ability to affect every one of your classmates (positively or negatively) each day. It is frustrating for me and visibly frustrating for the dedicated students in the class when AP students do not put forth their best effort. It is a privilege to be able to take a college-level course while still in high school, and I hope that you all will treat it as such. It is unfair to your classmates for you to not put forth your best effort.

Over the summer, you have two assignments that I think will benefit you greatly in preparation for AP Chemistry.

- 1) Commit to memory the basic facts I've included that you MUST know to have success in AP Chemistry. If you need to, make flash cards and look over them often during your summer vacation.
- 2) Complete the assignment that focuses on key areas in which you will be expected to be fluent.

Please note that the summer work is not expected to be a comprehensive review of everything covered in first-year chemistry. The summer homework reflects the material that it will be expected that you know as soon as you enter class. These topics, from the problems and the list of basic facts, will be assumed to be understood when we begin class next fall. It is expected that you will be able to competently perform all of the tasks that appear on the summer assignment. If you need assistance on any of the topics, you should send an e-mail message to me or get in touch with one of your future classmates.

For an idea of the types of questions we will be preparing for, you can access recent copies of the short answer portion of the AP Exam online.

<https://apcentral.collegeboard.org/courses/ap-chemistry/exam>

Thank you,

Mr. Porter
Retired AP Chemistry Teacher
bporter@abs.misd.net

THINGS TO KNOW!

1. You should be familiar with the periodic table.
 - a. Have a general idea where elements are
 - b. Know which elements are diatomic (H_2 , N_2 , O_2 , F_2 , Cl_2 , Br_2 , I_2)
 - c. Know chemical symbols for commonly used elements
2. You should be familiar with common ions
 - a. Know charges for metal and nonmetal ions
 - b. Know common polyatomic ions and their charges (sheet attached)
3. Know how to do unit conversions (like converting grams to moles)
4. You should be familiar with proper significant figures
5. You should be familiar with scientific notation
6. You should be familiar with concepts of atomic structure
 - a. Protons, neutrons, electrons
 - b. Atomic number, mass number, atomic mass
 - c. Electron configuration (like $1s^2 2s^2 2p^5$)
7. You should be able to name and write chemical formulas for compounds
 - a. Ionic compounds – no prefixes needed
 - b. Molecular compounds – use numerical prefixes (mono, di, tri, etc.)
8. You should be able to balance chemical equations
9. You should be able to predict the products of elementary reactions (synthesis, decomposition, single replacement, double replacement, combustion)
10. You should know ALL of the solubility rules (sheet attached)
11. You should be able to write net-ionic equations for elementary reactions.
12. You should be able to use stoichiometry, and a balanced chemical equation, to determine the amount (moles, grams, liters, molecules) of reactants or products needed in a chemical reaction.

POLYATOMIC IONS

Name	Formula and Charge	Name	Formula and Charge
Acetate	$C_2H_3O_2^-$	Hypochlorite	ClO^-
Ammonium	NH_4^+	Mercury (I)	Hg_2^{2+}
Carbonate	CO_3^{2-}	Nitrate	NO_3^-
Chlorate	ClO_3^-	Nitrite	NO_2^-
Chlorite	ClO_2^-	Oxalate	$C_2O_4^{2-}$
Chromate	CrO_4^{2-}	Perchlorate	ClO_4^-
Cyanide	CN^-	Peroxide	O_2^{2-}
Dichromate	$Cr_2O_7^{2-}$	Permanganate	MnO_4^-
Dihydrogen phosphate	$H_2PO_4^-$	Phosphate	PO_4^{3-}
Hydrogen carbonate or bicarbonate	HCO_3^-	Phosphite	PO_3^{3-}
Hydrogen phosphate	HPO_4^{2-}	Silicate	SiO_3^{2-}
Hydrogen sulfate or bisulfate	HSO_4^-	Sulfate	SO_4^{2-}
Hydrogen sulfite or bisulfite	HSO_3^-	Sulfite	SO_3^{2-}
Hydroxide	OH^-		

SOLUBILITY RULES FOR IONIC COMPOUNDS

General Rule	Exceptions
1. Ionic compounds with a group 1 metal (Li^+ , Na^+ , K^+ , Rb^+ , Cs^+) or ammonium (NH_4^+) are soluble.	None
2. Ionic compounds with nitrate (NO_3^-), chlorate (ClO_3^-) or acetate ($C_2H_3O_2^-$) are soluble.	None
3. Most ionic compounds with a chloride, bromide, or iodide (Cl^- , Br^- , I^-) are soluble.	silver, lead, mercury
4. Most ionic compounds with sulfate (SO_4^{2-}) are soluble.	silver, lead, mercury, calcium, barium, strontium
5. Most ionic compounds with carbonate (CO_3^{2-}), phosphate (PO_4^{3-}), or sulfide (S^{2-}) are insoluble.	Rule 1
6. Most hydroxides (OH^-) are insoluble.	Rule 1, calcium, barium, strontium

AP CHEMISTRY SUMMER WORK

Section 1 – Write the correct chemical formulas for the following ionic compounds

- | | |
|-----------------------|------------------------|
| 1. Magnesium fluoride | 6. Sodium nitrate |
| 2. Lithium nitride | 7. Aluminum bromide |
| 3. Potassium chloride | 8. Lithium sulfate |
| 4. Iron (III) sulfide | 9. Magnesium phosphate |
| 5. Calcium oxide | 10. Lead (II) acetate |

Section 2 – Write the correct chemical formulas for the following molecular compounds

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|---------------------------|-----------------------------|
| 1. Nitrogen dioxide | 5. Dinitrogen tetrafluoride |
| 2. Carbon tetrachloride | 6. Dichlorine monoxide |
| 3. Diphosphorus pentoxide | 7. Xenon hexafluoride |
| 4. Chlorine trifluoride | 8. Sulfur dioxide |

Section 3 – Name the following ionic compounds

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|-----------------------------|------------------------------|----------------------------|-------------------------------|
| 1. Na_2SO_4 | 3. Na_2O | 5. CaO | 7. Mn_2O_3 |
| 2. CuCl | 4. NH_4HCO_3 | 6. Cr_2O_3 | 8. $\text{Cu}(\text{NO}_3)_2$ |

Section 4 – Name the following molecular compounds

- | | | | |
|-------------------------|---------------------------|------------------------------|----------------------------|
| 1. N_2O | 3. N_2F_2 | 5. P_4O_{10} | 7. NCl_3 |
| 2. AsCl_3 | 4. N_2O_5 | 6. Cl_2O_7 | 8. As_4O_6 |

Section 5 – Tell how many moles of each element are present (use proper significant figures)

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|------------------|------------------|-----------------|
| 1. 46.0 g of Na | 3. 148.2 g of Hg | 5. 85.4 g of Mg |
| 2. 385.7 g of Pb | 4. 27.3 g of Br | 6. .358 g of Cu |

Section 6 – Determine the molar masses of the following compounds

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|-----------------------------|--------------------------|----------------------------|-------------------------------|
| 1. Na_2SO_4 | 2. Na_2O | 3. Mn_2O_3 | 4. $\text{Cu}(\text{NO}_3)_2$ |
|-----------------------------|--------------------------|----------------------------|-------------------------------|

Section 7 – Write the complete electron configuration and the noble gas configuration for the following elements in their ground state.

Ex. Ca: $1s^2 2s^2 2p^6 3s^2 3p^4 4s^2$ and $[\text{Ar}]4s^2$

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|---------------|-------------|--------------|
| 1. Phosphorus | 3. Fluorine | 5. Potassium |
| 2. Aluminum | 4. Nickel | 6. Silver |

Section 8 – Draw orbital diagrams for the following elements in their ground state. You may use noble gas notation if $Z > 36$.

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|--------------|-----------|-------------|-------------|
| 1. Magnesium | 2. Cobalt | 3. Selenium | 4. Titanium |
|--------------|-----------|-------------|-------------|

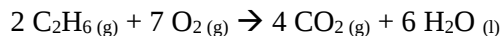
Section 9 – Draw Lewis structures for the following compounds and ions.

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|---------------------------|--------------------|---------------------|
| 1. CCl_4 | 3. NBr_3 | 5. CO_2 |
| 2. C_2H_6 | 4. NH_4^+ | 6. PCl_6^- |

Section 10 – Predict the products of these elementary reactions and write balanced chemical equations.

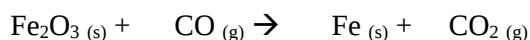
1. (Synthesis) Magnesium metal is burned in oxygen gas.
2. (Single replacement) Chlorine gas is added to a solution of potassium bromide.
3. (Double replacement) Solutions of lead (II) nitrate and sodium chloride are mixed.
4. (Single replacement) Aluminum metal is added to a solution of copper (II) chloride.

Section 11 – Stoichiometry; answer the following questions about the balanced equation below:



1. How many moles of carbon dioxide are formed when two moles of ethane are burned?
2. How many grams of water are formed when 25.1 g of ethane are burned?
3. What volume (at STP) of oxygen gas is needed to completely react with 4.25 moles of ethane?

Section 12 – Limiting reactants; answer the following questions about the equation below.



1. Balance the equation.
2. Give the correct name for each of the substances in the reaction.
3. Given 124 g of $\text{Fe}_2\text{O}_3 (\text{s})$ and 32.5 g of $\text{CO} (\text{g})$,
 - a) determine the limiting reactant for the above reaction.
 - b) determine what mass of $\text{Fe} (\text{s})$ will be formed in the reaction described.